ANNUAL REPORT

1961

CITY OF KITCHENER

KITCHENER SEWAGE TREATMENT PLANT

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The Kitchener Sewage Treatment Plant was enlarged and renovated in 1959 to handle the increased needs of the City of Kitchener. A small activated sludge plant called Spring Valley was replaced by a modern pumping station which was built on the site of the old plant.

The Spring Valley Pumping Station is a modern pumping station equipped with two 2500 GPM pumps each driven by a 100 hp electric motor. In the case of power failure, a 3,750 GPM diesel engine cuts in automatically. A 20 inch force main carries the sewage to a higher location in the municipal sewer system and from there it flows by gravity to the Doon Sewage Treatment Plant. A by-pass to the Grand River is provided.

The pumping station is completely automatic but it has been found that during periods of storm flow the discharge from the force main overloads the existing gravity sewers and floods some basements.

In April an additional telephone line was rented and telemetering equipment installed which enabled the operators from the main plant at Doon to shut the pump off whenever it rains. The operators now receive a telephone call from the Fire Chief's office whenever a rain is noted in the city.

The pumping station initially went into operation on May 13, 1960 but was manually operated until the controls had been properly adjusted and the alarm system to the Doon plant hooked up. During the initial operation of the station, it was found that stones were

constantly plugging the pumps. A stone baffle was installed which solved the problem.

TABLE I

LABORATORY RESULTS

SPRING VALLEY PUMPING STATION

1961

DATE	5 DAY B.O.D. (ppm)	S.S. (ppm)
Jan. 5	730	204
Jan. 18	1340	1628
Feb. 1	1500	796
Feb. 15	370	220
Mar. 1	520	204
Mar. 14	620	306
Mar. 30	290	292
Apr. 19	940	1208
May 30	820	552
June 20	650	326
July 11	820	322
Aug. 1	350	396
Aug. 22	245	256
Sept. 19	325	268
Oct. 3	1040	470
Oct. 24	750	644
Nov. 15	2400	1420
Dec. 5	630	370
AVERAGE	797	549

All of the above results were obtained by grab samples which are not a true indication of the strength of the sewage. The

average results do, however, give a good indication of the strength of sewage coming into the pumping station. It is obvious that sewage flowing into the Spring Valley Pumping Station is extremely strong and all possible efforts should be made to pump this sewage to the Doon plant for treatment rather than by-pass it into the Grand River.

Due to the abnormally large quantities of grit the two electrically driven pumps have become prematurely worn. It has been found that the shaft sleeves have become grooved and the impeller clearances have increased to the point where excess leakage occurred and the pump capacity decreased.

In an attempt to rectify the situation, it is recommended that we incorporate changes in the various components in the pumps. Babcock-Wilcox Ltd. have submitted prices for the components and they total approximately $2,000.

The grit problem is due to the combined sewer system and unpaved streets in the north ward. If the special components to be incorporated in the pumps do not last for a normal length of time, a grit chamber in front of the pumping station may be necessary.

The operators of the Doon Plant visit the pumping station once a week for inspection, grounds maintenance, cleaning and lubrication.

The flow into the Doon plant enters via a 48" diameter trunk main. The previous design flow for the plant was 4 mgd but the present design is for 11.5 mgd.

The flow into the plant passes through a coarse bar screen where extremely large objects are removed from the flow. The sewage then

flows through a 3 foot Parshall flume where the flow is indicated and recorded. Some difficulties have been encountered in trying to maintain the indicating and recording instruments in proper adjustment. The downstream characteristics of the flume are poor due to the closeness of the two rotograter chambers and the center by-pass screen.

Difficulties have been encountered with both rotograters ever since the initial installation. These rotograters are mechanically cleaned screens equipped with revolving cutters which shred larger particles in the sewage. In June, 1960, shortly after the rotograters had been put into service, an excessive number of shear pins were broken. Dr. Wormser of Infilco came up from Tucson, Arizona to study the situation and determined that eddy currents immediately upstream from the rotograter deposited excessive amounts of silt and debris in the corner of the channel and, when the cutting rake descended, it had to force its way through the built-up debris and broke the shear pins. Baffling the flow upstream from the rotograters solved this particular problem.

At the end of March, 1961, both rotograters were removed from their chambers because the comminutor shafts, sleeves and oil seals had been badly worn by grit particles. Some of the metal replacement parts were made in a local machine shop, but the installation of the units was delayed because other parts had to come from Arizona.

After the sewage passes through the rotograters, it enters the screen and grit building where it is divided into two equal portions

and passes through two aerated grit chambers. The sand and grit is removed and air lifted to a hopper where it falls into a small railway car which is then dumped into the back of a jeep for final disposal on the plant site.

Both air degrittors are 16' x 10' x 12' swd, have a total volume of 23,000 gallons which provides a retention period of three minutes. No significant problems have been encountered in the operation of these chambers. Approximately 400 cu. ft. of grit is removed each month which is slightly above a normal quantity of two cu. ft. per million gallons of sewage treated.

The flow from the air degrittors may go directly to the four sedimentation tanks or may be routed through two fine mesh rotary screens. These screens remove the smaller particles which pass through the rotograters. These screens were initially not put into operation because it was felt that the rotograters were sufficient and some expensive replacement parts were needed. It is very desirable to be able to cut up screenings and digest them rather than to collect them separately. The cause of some of the difficulties in the primary digesters was finally traced to the non-operation of these screens so the necessary spare parts were purchased at a cost of $2,350 and the screens were put into operation. Approximately 1000 cu. ft. of screenings are removed each month and buried on the plant site.

A grease separator is located on each side of the grit building ahead of the primary sedimentation tanks. As the sewage flows through these units, large quantities of air are bubbled through, which se-

parates the grease from the sewage and causes it to rise to the surface. The resulting grease forms balls in the sedimentation tanks and is removed manually.

There are now four primary sedimentation tanks at the plant, three older type units and one new unit. Each of the tanks are 60' x 60' x 11.75 swd and provide a retention of 2.2 hours at design flow. The laboratory results for the last four months of 1960 indicate that the average reduction in BOD and SS was 29.6% and 47.1% respectively. In 1961, the average reduction in BOD and SS was 31% and 35% respectively. The afore-mentioned figures indicate that the plant is as efficient as can be expected from a primary plant. The effluent from the sedimentation tanks goes directly to the Grand River without further treatment.

Minor difficulties have been encountered with the three older mechanisms because of their age. All of the needed parts such as wheels, etc. have been made in a local machine shop and replaced by the plant staff.

Raw sludge from the No. 1 and 2 sedimentation tanks (both older type units) is run by gravity into the two primary digesters. The sludge from No. 3 and 4 tanks (No. 4 is the new type) is pumped to the primary digesters. The pump was very old and beyond repair and was replaced in 1961 with a new pump.

Each of the two primary digesters is 65' in diameter with a 22' swd having a volume of 450,000 Imperial gallons. Both of these tanks have a fixed concrete roof held up with a structural steel bridge. Each one is equipped with a new draft tube mixer and is provided with

level controls which automatically record the level of the liquid in the tanks.

Heating of both primary digesters is accomplished with two Rayscott hot water boilers and two spiral heat exchangers. The boilers are set up to burn both fuel oil and digester gas. Water temperature in the spiral heat exchangers is held at the proper level by the thermostat settings on the boiler. The temperature in both digesters is maintained by controlling the amount of circulation through the heat exchangers.

Numerous difficulties were encountered in trying to burn digester gas in the boilers. These difficulties were caused by a number of problems encountered in both primary and secondary digesters which will be discussed on the following pages.

In the initial startup of the primary digesters, the fine screens were not in operation and the sludge in the digesters was of a coarse nature. Both digesters were started with a large quantity of sludge. In July, 1960, the sludge recirculation pumps and the pipe work immediately preceding the pumps was observed to heat up and later it was found that the sludge pumps were not pumping the sludge. This problem was studied by the pump manufacturer and the Commission for some explanation of the frequent plugging which put an unnecessary work load on the operating staff.

The whole situation soon turned into a dilemma. The pumps would continually plug unless the coarse solids were digested and the solids could not be digested because we could not circulate the solids and heat the digester.

Rather than purchase a new set of pumps with larger openings, it was decided to purchase the missing parts for the fine screens and to put them into operation and then empty the digesters and start anew with clarified sewage and add only screened sludge.

Another related problem in the operation of the digesters was the fact that the scum on the surface plugged the float chamber for the automatic level controls. This level is now determined manually.

By the end of 1960, both the fine screens had been put into operation and one primary digester had been successfully started and put into full operation. The other primary digester has since been put into full operation.

The two new secondary digesters are unheated tanks equipped with steel floating covers. They are each 100 feet in diameter with 29 feet mean water level. Each tank has a volume of 1,250,000 Imperial gallons.

In September, 1960, it was noticed that the superntant draw-off on one of the secondary digesters was leaking and had become inoperative. It was later noticed that the other secondary digester was in the same condition. During February, 1961, the gas collection line on one of the secondary digesters broke and no gas could be drawn off.

It was then decided to dewater this particular digester in order to make the necessary repairs. By April, 1961, the tank had been emptied by filtering the sludge and the consultant and the equipment manufacturer inspected the interior of the tank. It was found that the supernatant selector had been put on upside down, one of the tie

rods to the roof had broken, and the gas collection line had broken off flush with the tank wall. The supernatant selector and tie rod were fixed and the gas collection pipe was repaired by a contractor.

After all the digesters were returned to service, it was found that the boilers could not operate satisfactorily because of erratic gas pressures. The trouble was finally traced to the gas lines coming from the primary digesters. These lines had been in service for a very long period of time and had undoubtedly become partially plugged. A new gas piping system was installed and the gas problem has been solved.

Sludge from the secondary digesters is pumped over to the filter building where ferric chloride and lime are added and the mixture dewatered on a vacuum filter. In 1961, a total of 2488 tons of dry sludge were filtered using 127 tons of lime and 52 tons of ferric chloride.

Very few equipment difficulties have hampered the sludge filtering operation. The vacuum pump seized a few times due to internal lime deposits but this was solved by installing a small water softener on the sealing water line. A roof exhaust fan was installed in the sludge hopper to remove the ammonia fumes which were bothering the operators.

SLUDGE HAULING

Sludge haulage was initially undertaken by Mayfarm Nurseries in Galt. Mr. May was soon overwhelmed by the large quantities of sludge and discontinued hauling at the end of 1960.

The sludge disposal problem was discussed with Mr. Bradley and

it was decided that in 1961 the city would provide a dump truck and that the sludge would be disposed of on the plant site with a consequent saving in sludge hauling costs. This method of disposal has proven to be successful to date but the amount of land on the plant site is limited.

It is recommended that the disposal of sludge be promoted to the local farmers. When secondary treatment is provided at the plant, the ultimate disposal of sludge will become quite critical and it is imperative that a demand for the sludge be developed now. It is recommended that the city provide one truck in addition to the one already at the plant and a driver. When the weather will allow the disposal of sludge to farmers' fields both trucks can be used. Since the extra truck and man are not needed full time, it is recommended that the city bill us for truck and driver when they are used.

PLANT OPERATING STAFF

Previous to OWRC operation, the Doon Sewage Treatment Plant employed 17 men under the supervision of Mr. Alex Becker and the Spring Valley Sewage Treatment Plant employed four men under the supervision of Mr. Ed Hood. The total number of employees engaged in sewage treatment was therefore 23.

When the OWRC assumed operation, most of the men transferred over to the OWRC although a few decided to remain with the city.

At the present time the work force consists of,

1. A. Becker, Superintendent
2. W. Reinhart, Plant Mechanic
3. L. Edwards, Plant Electrician

4. W. Pohl, Operator
5. J. O'Reilly, Operator
6. J. Halley, Operator
7. P. Kuehl, Operator
8. F. Dobson, Operator
9. H. Bowie, Operator
10. E. Wheeler, Operator
11. L. Lebegut, Operator
12. A. Schlueter, Operator
13. Z. Etmansky, Operator
14. A. Nielsen, Grounds keeper, caretaker

TABLE II

KITCHENER-DOON SEWAGE TREATMENT PLANT

SAMPLING RESULTS

1961

MONTH	AVERAGE B.O.D.		AVERAGE	AVERAGE S. S.		AVERAGE
	INFLUENT	EFFLUENT	% REDUCTION	INFLUENT	EFFLUENT	% REDUCTION
JAN.	321	227	29.4	244	194	20.4
FEB.	260	198	23.8	277	144	48.0
MAR.	243	180	26.0	205	136	33.9
APR.	243	191	21.3	240	145	35.6
MAY	337	152	55.0	261	146	44.1
JUNE	236	154	31.1	298	154	47.5
JULY	305	165	46.9	309	165	43.3
AUG.	272	176	35.6	237	138	39.2
SEPT.	284	183	40.9	271	152	42.6
OCT.	365	186	42.0	262	173	33.1
NOV.	419	202	51.2	431	137	67.0
DEC.	282	190	30.8	306	153	49.6
YEARLY AVG.	297	184	36.2	278	153	42.0

TABLE III

KITCHENER-DOON SEWAGE TREATMENT PLANT

FLOW RECORD

MONTH	AVERAGE DAILY FLOW	TOTAL MONTHLY FLOW	MINIMUM FLOW	MAXIMUM FLOW
JANUARY	NO SUMMARY SHEETS WERE MADE OUT.			
FEBRUARY				
6 - 12	7.56		4.78	11.67
13 - 18	5.96		2.81	8.38
19 - 25	9.13		3.80	9.50
		155.18		
MARCH				
26 - 4	5.87		3.19	7.14
5 - 11	6.18		3.19	8.04
12 - 18	7.90		6.02	8.89
19 - 25	7.07		6.30	7.18
		213.60		
APRIL				
26 - 1	6.62		4.75	7.86
2 - 8	6.10		4.04	7.12
9 - 15	6.05		4.10	7.79
16 - 22	6.66		5.10	8.04
23 - 29	6.43		4.42	8.49
		193.91		
MAY				
30 - 6	6.82		4.97	7.88
7 - 13	6.78		5.13	7.75
14 - 20	7.70		3.88	9.13
21 - 27	7.72		5.72	8.97
		229.27		

TABLE III

MONTH	AVERAGE DAILY FLOW	TOTAL MONTHLY FLOW	MINIMUM FLOW	MAXIMUM FLOW
JUNE				
28 - 3	7.83		5.76	8.95
4 - 10	7.23		4.99	9.10
11 - 17	6.11		4.15	7.46
18 - 24	6.12		4.90	7.63
25 - 1	5.95		3.89	6.61
		202.06		
JULY				
2 - 8	6.71		4.38	9.55
9 - 15	8.44		4.93	11.96
17 - 22	9.08		7.16	10.13
23 - 30	7.51		4.03	8.89
		245.45		
AUGUST				
31 - 5	9.13		8.83	10.48
7 - 13	9.33		6.06	11.35
14 - 19	9.59		7.00	10.65
20 - 27	10.00		7.31	11.95
		297.05		
SEPTEMBER				
28 - 2	9.71		7.31	10.97
3 - 9	12.59		8.16	13.40
10 - 16	10.06		7.68	10.62
17 - 23	10.52		8.58	15.53
24 - 30	12.30		8.72	14.64
		301.22		

MONTH	AVERAGE DAILY FLOW	TOTAL MONTHLY FLOW	MINIMUM FLOW	MAXIMUM FLOW
OCTOBER				
1 - 7	10.81		8.78	12.99
8 - 14	10.15		6.54	13.96
16 - 21	9.97		6.34	11.61
22 - 29	9.79		5.25	11.71
		305.78		
NOVEMBER				
30 - 4	11.07		9.48	12.09
5 - 11	8.42		5.86	10.38
12 - 18	7.85		4.80	9.97
19 - 25	8.11		5.88	9.34
		215.52		
DECEMBER				
26 - 2	8.22		5.83	9.31
3 - 9	8.81		5.25	10.66
10 - 16	8.71		5.85	10.18
17 - 23	7.89		5.72	9.70
24 - 31	6.73		3.14	8.60
		282.52		

TOTAL YEARLY FLOW 2649.6 MG

TABLE IV

KITCHENER-DOON SEWAGE TREATMENT PLANT

VACUUM FILTERING RESULTS

1961

MONTH	TOTAL HOURS OF OPERATION	TOTAL POUNDS DRY SOLIDS FILTERED	AVERAGE PERCENT LIME as CaO	AVERAGE PERCENT $FeCl_3$	AVERAGE MOISTURE CONTENT PERCENT	AVERAGE YIELD POUNDS PER SQUARE FT. PER HOUR
JAN.	102.5	487,890	4.9	1.7		
FEB.	130.7	502,649	5.3	1.6		
MAR.	83.1	301,074	4.7	1.6	74	7.0
APR.	103.0	339,281	6.3	2.3	70	6.5
MAY	133.3	463,492	5.8	3.2	71	6.9
JUNE	226.0	828,816	5.0	2.1	70	7.2
JULY	149.3	491,879	4.6	2.4	72	6.3
AUG.	87.0	308,154	4.2	2.0	69	6.9
SEPT.	148.9	438,023	4.0	1.7	70	7.8
OCT.	117.5	410,234	5.3	2.0	72.3	7.0
NOV.	42.0	164,824	5.0	2.1	71.8	7.8
DEC.	66.8	240,238	5.7	2.2	69.0	7.2
TOTAL	1290.1	4,976,554				
AVERAGE	107.5	414,713	5.1	2.1	70.9	7.1

KITCHENER-DOON SEWAGE TREATMENT PLANT

VACUUM FILTERING

COSTS PER TON OF DRY SOLIDS REMOVED

1961

MONTH	FERRIC CHLORIDE	PICKLING LIQUOR	LIME	LABOUR	ELECTRICITY	MAINTEN-ANCE	TOTAL
JAN.	2.27		1.54	1.68	1.40	0.27	7.16
FEB.	2.22		1.70	2.07	1.40	0.26	7.65
MAR.	2.16		1.46	2.21	1.40	0.43	7.66
APR.	2.72		3.25	2.42	1.40	0.38	10.17
MAY	3.37		2.31	2.30	1.40	0.28	9.66
JUNE		0.61	1.56	2.18	1.40	0.16	5.91
JULY		0.64	1.41	4.01	1.40	0.26	7.72
AUG.		0.57	1.26	2.26	1.40	0.42	5.91
SEPT.		0.48	1.26	2.02	1.40	0.30	5.46
OCT.		0.56	1.85	2.29	1.40	0.32	6.42
NOV.		0.62	1.43	2.04	1.40	0.79	6.28
DEC.		0.64	1.68	2.22	1.40	0.54	6.48
AVG.	2.55	0.59	1.73	2.31	1.40	0.37	7.21
	(1.40)						

All the above costs are based on amount of solids sent to the filter and do not make allowance for the solids which return in the filtrate. Much more extensive laboratory work is required to make an accurate determination of the amount of dry solids actually removed.

KITCHENER-DOON SEWAGE TREATMENT PLANT

ESTIMATED BUDGET

1962

STAFF PAYROLL	
A. Becker - Superintendent	6,000
W. Reinhardt - Mechanic	4,400
L. Edwards - Electrician	4,400
10 shift operators @ 4200	42,000
Laboratory Technician @ 3900	3,900
Groundkeeper & Caretaker @ 3900	3,900
TOTAL REGULAR PAYROLL	$ 64,600
Superannuation 5%	3,230
	$ 67,830
CASUAL PAYROLL	
Summer help to relieve during holidays.	2,000
FUEL	
Estimate $1,000	1,000
POWER	
Spring Valley Pumping Station	
Doon Sewage Treatment Plant	
Estimate $1200 per month x 12 months.	$ 14,400
CHEMICAL	
Estimate 2700 tons of dry solids	

CHEMICAL - Continued

Ferric Chloride)) 1.40 x 2700 Pickle Liquor)		$ 3,780
Lime 162 tons @ $22 per ton		3,600
TOTAL CHEMICAL COSTS		$ 7,380

GENERAL SUPPLIES

Estimate $200 per month x 12 months	$ 2,400

EQUIPMENT

Estimate $100 per month x 12 months	$ 1,200

REPAIRS & MAINTENANCE

Spring Valley Pump Repairs	$ 2,500
Estimate $100 per month x 12 months	1,200
TOTAL	$ 3,700

SLUDGE HAULAGE

City truck rental @ $5 per hour truck and driver 40 hours per week for 20 weeks	$ 4,000

SUNDRY

Estimate $400 per month x 12 months	$ 4,800

INSURANCE & TAXES

Taxes	$ 5,000
Insurance paid till end of 1963 but should budget 1/3 cost per year	3,000
TOTAL ANNUAL BUDGET	$116,710

KITCHENER OPERATING COSTS FOR 1961

MONTH	EXPENDI-TURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	SUPPLIES	EQUIPMENT	REPAIR AND MAINTENANCE	WATER	SUNDRY
JAN.	6079.53	4329.42	394.16	6.75	1017.49		250.30				126.41
FEB.	13729.85	4394.56	277.04	1699.41	1136.53	1701.67	295.28	3797.85			427.51
MAR.	6969.39	4412.98	277.04	511.10	1179.66	450.20	4.40				134.01
APR.	9456.08	4412.98	277.04	1379.80	1197.45	1446.91	444.17				397.73
MAY	7741.02	4392.68	512.68		1070.03	369.14	118.13		1142.21		136.15
JUNE	11697.47	4415.74	554.08	511.10	984.01	972.00	4.45				4256.09
JULY	8221.09	4400.96	554.08	1113.87	442.18	737.20	231.23	403.12	123.10		215.35
AUG.	13086.47	6589.02	993.74	15.41	1561.08	266.50	521.84		66.50		3072.38
SEPT.	6597.66	4767.30	263.20		998.32	314.50	27.19		10.05	26.90	190.20
OCT.	8962.81	4642.52	13.68	50.19	957.97	1668.97	118.24	329.93	548.53		642.78
NOV.	6899.75	4642.52		534.83	965.41	304.70	137.94	139.06			175.24
DEC.	18448.03	6963.78		1049.56	963.50		316.94		338.80	105.66	8709.81
	118269.08	58364.46	4071.74	6772.07	12473.63	8212.43	2489.45	4520.00	2368.25	132.56	18863.59
		62436.20									